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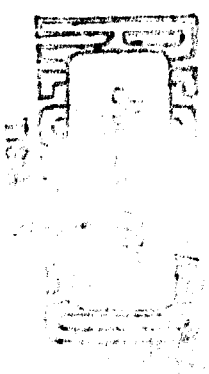
AIRCRAFT ARMAMENTS, Inc.
COCKEYSVILLE, MARYLAND



AIRCRAFT ARMAMENTS, Inc.

QUARTERLY PROGRESS REPORT

INVESTIGATION OF T[illegible]ECARTRIDGE
DISSEMINATION TECHNIQUES

CONTRACT NO. DA18-108-AMC-80(A)
CP3-9800

ER-3043A
REPORT NO.

July 1963
DATE

Prepared by:
F.C.LaTrobe, J.R.Hebert

R.C.Moyer

AAI 135A

AIRCRAFT ARMAMENTS, Inc.

QUARTERLY REPORT

FOR THE PERIOD OF 1 APRIL THROUGH 30 JUNE 1963

CONTRACT NO. DA18-108-AMC-80(A) CP3-9800

I. INTRODUCTION

This is the second in a series of quarterly progress reports which will be submitted under the terms of Contract No. DA18-108-AMC-80(A) CP3-9800.

II. RESUME OF ACCOMPLISHMENTS

During the period of 1 April to 30 June 1963, existing hardware was redesigned and new hardware constructed to improve results and facilitate the gathering of data. All nozzles were increased in strength to conform to higher pressures. New nozzle drilling configurations were designed and tested. Figure 1 shows a 16-hole nozzle; Figure 2 shows a 92-hole nozzle.

Different methods of tapping liquid pressures were tried in order to obtain more accurate time values on the pressure curves. This improvement is still under development.

Breech and propellant chamber hardware were redesigned to give closer proportions of loading desnities between propellant chambers and expansion volumes for the various powder charges in the high-low propellant system.

The media tested during this quarter included two liquids, water and DMHP, and one slurry, egg albumin in carbon tetrachloride. The slurry consisted of egg albumin, ground to approximately 10 micron diameter particle size, and carbon tetrachloride in 10, 15, 20 and 30% mixtures by weight.

A series of instrumented shots were made at AAI test facilities to gather background data to relate pressure to performance for the various media. A

representative series of these shots was fired at the ACC test facilities for dissemination measurement.

These media were tested with powder charges ranging from 10 to 45 grains through the three different nozzles.

Figures 3, 4, 5, 6, 7 and 8 show results of individual tests conducted at the ACC test facilities. Curves relating to these tests are in Figures 9, 10, 11, 12, 13 and 14.

During this quarter, two preliminary devices for disseminating powders were designed and sufficient hardware to make two shots of each method was fabricated. Figure 15 shows the plan of the first method, Figure 16 shows the plan of the second method.

Two shots were made using the hardware shown in Figure 15. Both of these shots were mechanically successful. The method shown in Figure 16 has not yet been test fired.

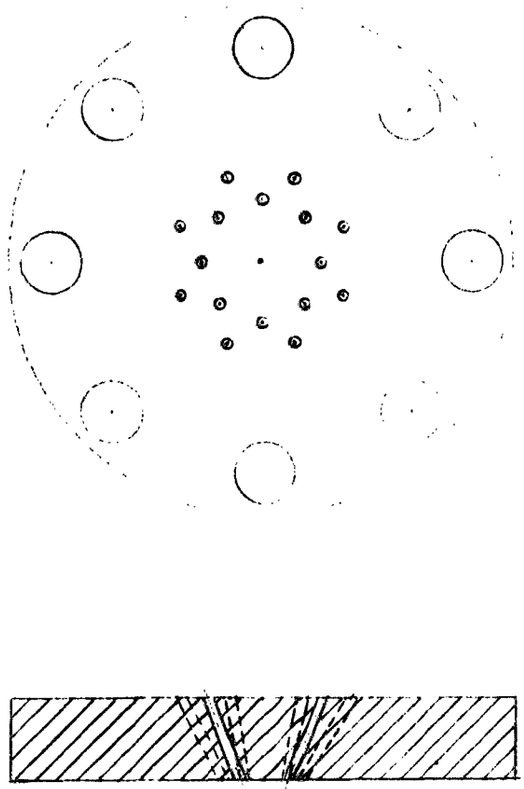
III. RECOMMENDATIONS FOR FUTURE INVESTIGATIONS

From the results of the tests conducted to date, new nozzles using a greater cone angle will be made.

Time-pressure and fluid properties data will continue to be gathered and analyzed.

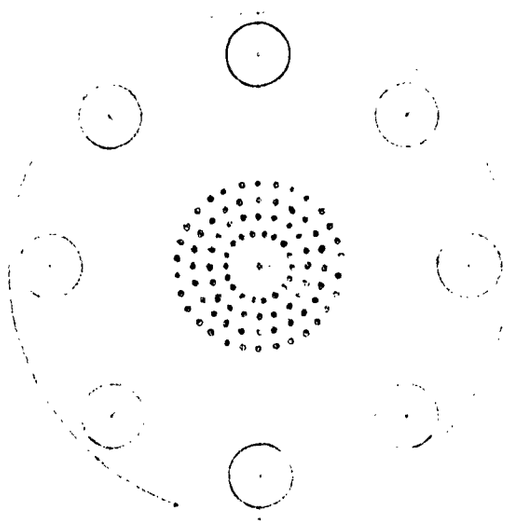
Additional tests will be conducted with the simulants previously tested in order to increase the yield of the present design. Subsequent investigations will be directed toward other simulants with emphasis being placed on measurement of aerosol particle size.

High speed motion pictures will also be taken for assessment of cloud configuration and dissemination stroke time.



Nozzle with 16 (.039 dia.) Holes

FIGURE 1



Nozzle with 92 (1/64" dia.) Holes

FIGURE 2

Run No.	637	636	633	634	635
Charge	20	30	35	37	40
Time					
1-1/4	18.0	16.7	19.7	28.8	31.0
3-1/4	40.5	34.3	38.1	27.8	44.9
7-1/4	47.2	36.6	44.3	44.3	43.2
15-1/4	48.0	43.0	36.9	45.1	58.4

Test Series No. 2
17 April 63
Corresponds to curves on Figure No. 9

FIGURE 3

Run No.	643	644	645
Charge	20	30	40
Time			
1/2 to 1-1/2	51	60	53.8
2-1/2 to 3-1/2	42.3	46.3	52.4
4-1/2 to 5-1/2	42.7	46.9	54.7
6-1/2 to 7-1/2	37.3	47.8	52.2
8-1/2 to 9-1/2	42.8	48.3	53.7
10-1/2 to 11-1/2	46.1	46.4	66.3
12-1/2 to 13-1/2	43.1	43.7	65.7
14-1/2 to 15-1/2	42.4	46.2	49.5
1/2 to 1-1/2	50.7	59.5	59.5
6-1/2 to 7-1/2	48.9	53.3	55.1
14-1/2 to 15-1/2	47.2	54.6	53.3

Test Series No. 3
2 May 63
Corresponds to Curves on Figure 10

FIGURE 4

Run No.	646	648
Charge	20	40
Time		
1	31.5	48.4
3	43.6	50.1
5	45.7	46.6
7	44.6	47.8
9	45.8	46.2
11	45.1	47.4
13	46.0	51.5
15	44.7	46.1
1	40.2	45.5
7	48.1	51.8
15	49.1	51.5

Test Series No. 4
16 May 63
Corresponds to Curves on Figure 1

FIGURE 5

Run No.	S209	S210
Charge	20	30
Time		
1/2	14.1	22.5
1-1/2	19.0	19.0
2-1/2	14.8	11.3
3-1/2	12.0	9.9
4-1/2	14.1	9.9
6-1/2	10.6	7.0
8-1/2	11.3	6.3
10-1/2	11.3	4.9
15-1/2	8.4	4.2
20-1/2	2.1	4.2
25-1/2	6.3	3.5
30-1/2	6.6	3.5

Test Series No. 5
23 May 63
Corresponds to Curves on Figure 12

FIGURE 6

Run No.	S211	S218	S220
Charge	30	30	30
Time			
1/2	19.0	72.6	12.7
1-1/2	22.5	58.6	17.8
2-1/2	20.4	40.5	10.3
3-1/2	16.9	33.5	6.6
4-1/2	11.3	20.9	4.7
6-1/2	10.6	14.0	2.8
8-1/2	7.7	12.6	5.2
10-1/2	6.3	19.5	1.9
15-1/2	4.9	5.6	.1
20-1/2	4.2	12.6	.3
25-1/2	2.8	5.6	1.4
30-1/2	----	4.2	1.9
1-1/2	----	97.7	31.9
8-1/2	----	50.2	4.2

Test Series No. 6
6 June 63
Corresponds to Curves on Figure 13

FIGURE 7

Run No.	S224	S225
Charge	20	20
Time		
1/2	15.1	6.4
1-1/2	15.1	12.8
2-1/2	12.3	9.2
3-1/2	8.2	16.5
4-1/2	19.2	10.1
6-1/2	8.2	23.9
8-1/2	9.6	4.6
10-1/2	13.7	5.5
15-1/2	4.1	7.3
20-1/2	11.0	2.8
25-1/2	9.6	9.2
30-1/2	5.5	3.7
1-1/2	32.9	45.8
8-1/2	35.6	15.6

Test Series No. 7
13 June 63
Corresponds to Curves on Figure 14

FIGURE 8

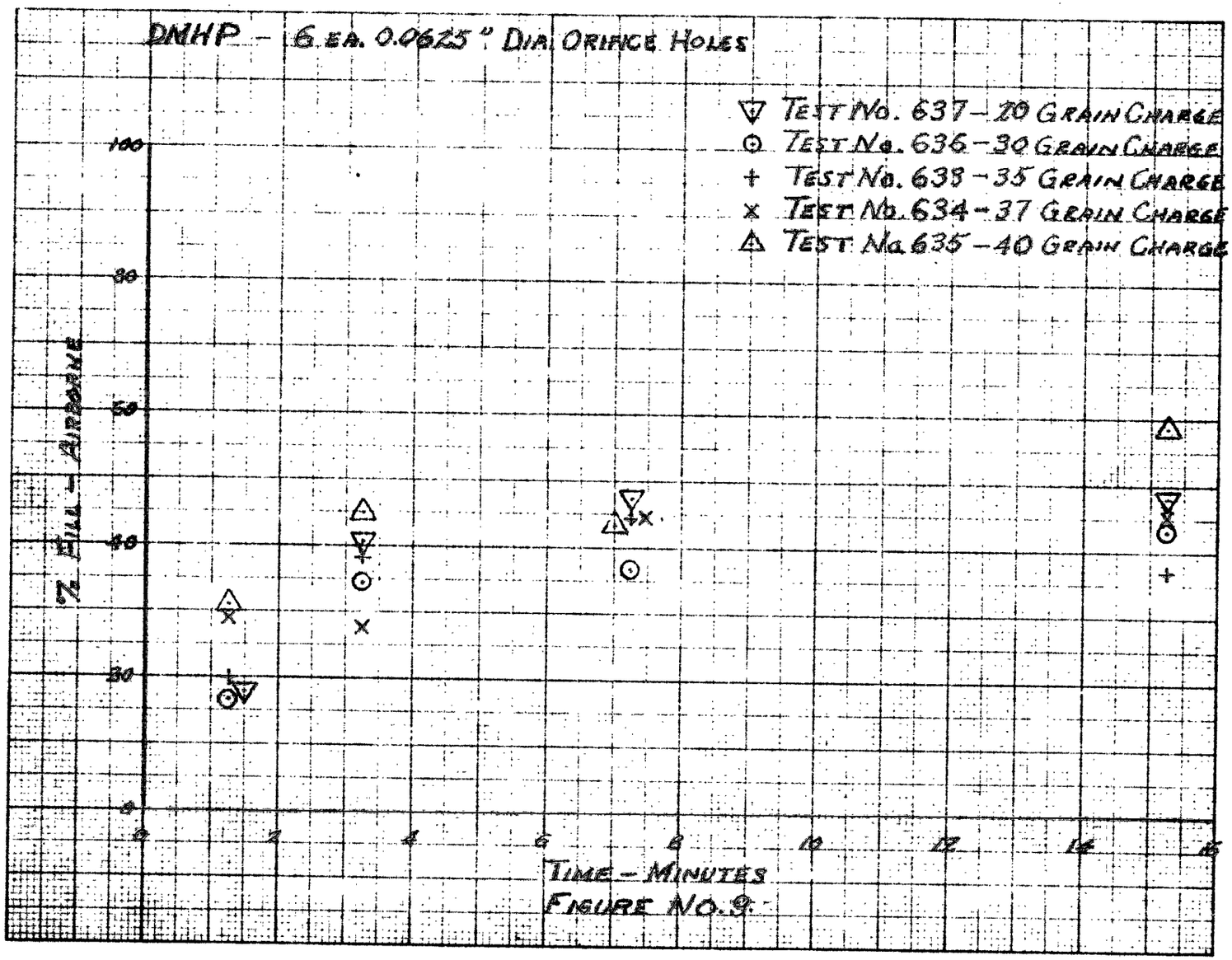

DMHP - 6 EA. 0.0625" DIA. ORIFICE HOLES
TEST NO. 637 - 20 GRAIN CHARGE
TEST NO. 636 - 30 GRAIN CHARGE
TEST NO. 638 - 35 GRAIN CHARGE
TEST NO. 634 - 37 GRAIN CHARGE
TEST NO. 635 - 40 GRAIN CHARGE
% FILL - AIRBORNE
100
80
60
40
20
0
0
2
4
6
8
10
12
14
16
TIME - MINUTES

FIGURE NO. 9

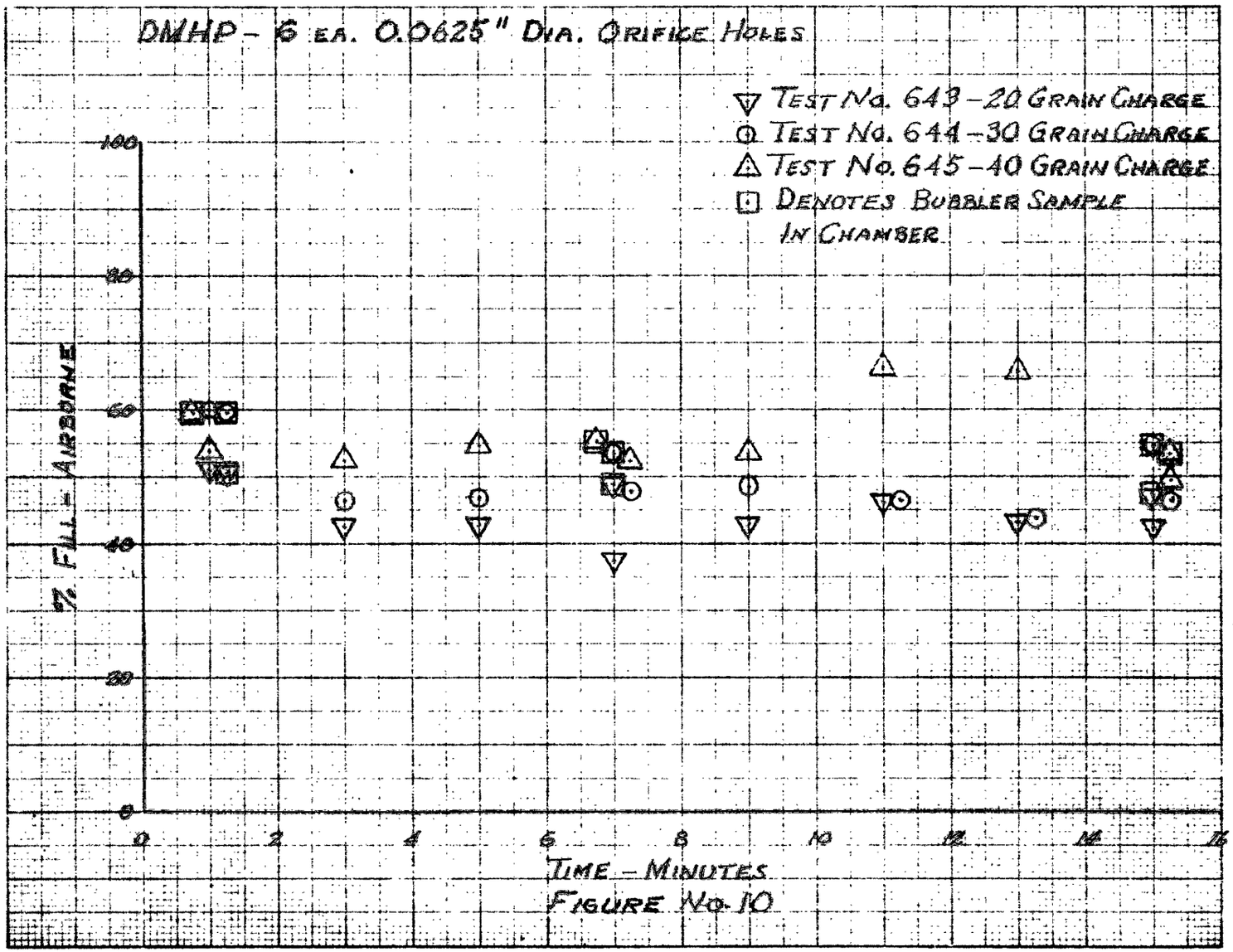

DMHP - 6 EA. 0.0625" DIA. ORIFICE HOLES
TEST No. 643 - 20 GRAIN CHARGE
TEST No. 644 - 30 GRAIN CHARGE
TEST No. 645 - 40 GRAIN CHARGE
DENOTES BUBBLER SAMPLE IN CHAMBER
% FILL - AIRBORNE
100
80
60
40
20
0
0
2
4
6
8
10
12
14
16
TIME - MINUTES

FIGURE NO. 10

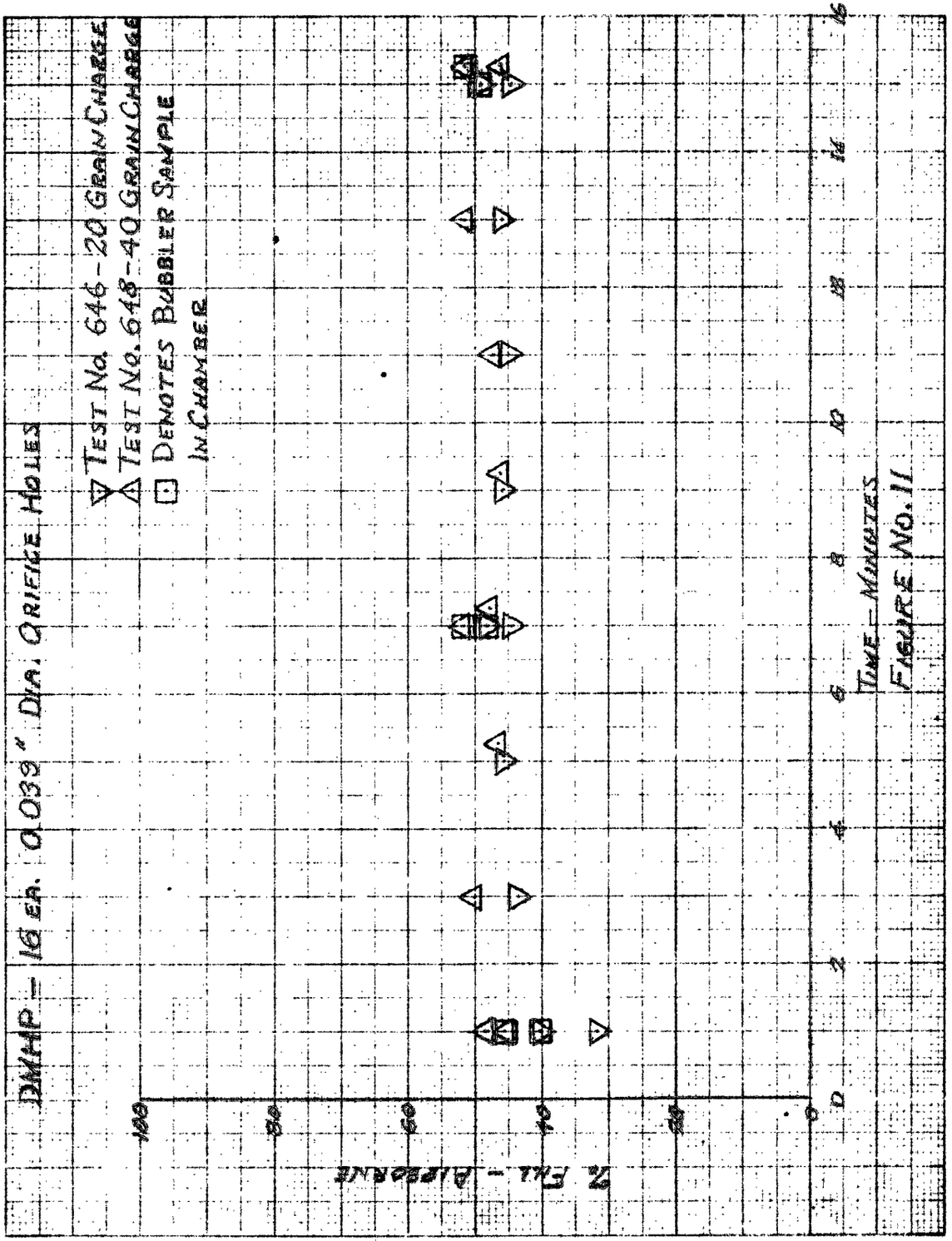

DMAP - 16 EA. 0.039" DIA. ORIFICE HOLES
TEST No. 646 - 20 GRAIN CHARGE
TEST No. 648 - 40 GRAIN CHARGE
DENOTES BUBBLER SAMPLE IN CHAMBER
% FULL - ALTITUDE
100
80
60
40
20
0
0
2
4
6
8
10
12
14
16
TIME - MINUTES

FIGURE NO. 11

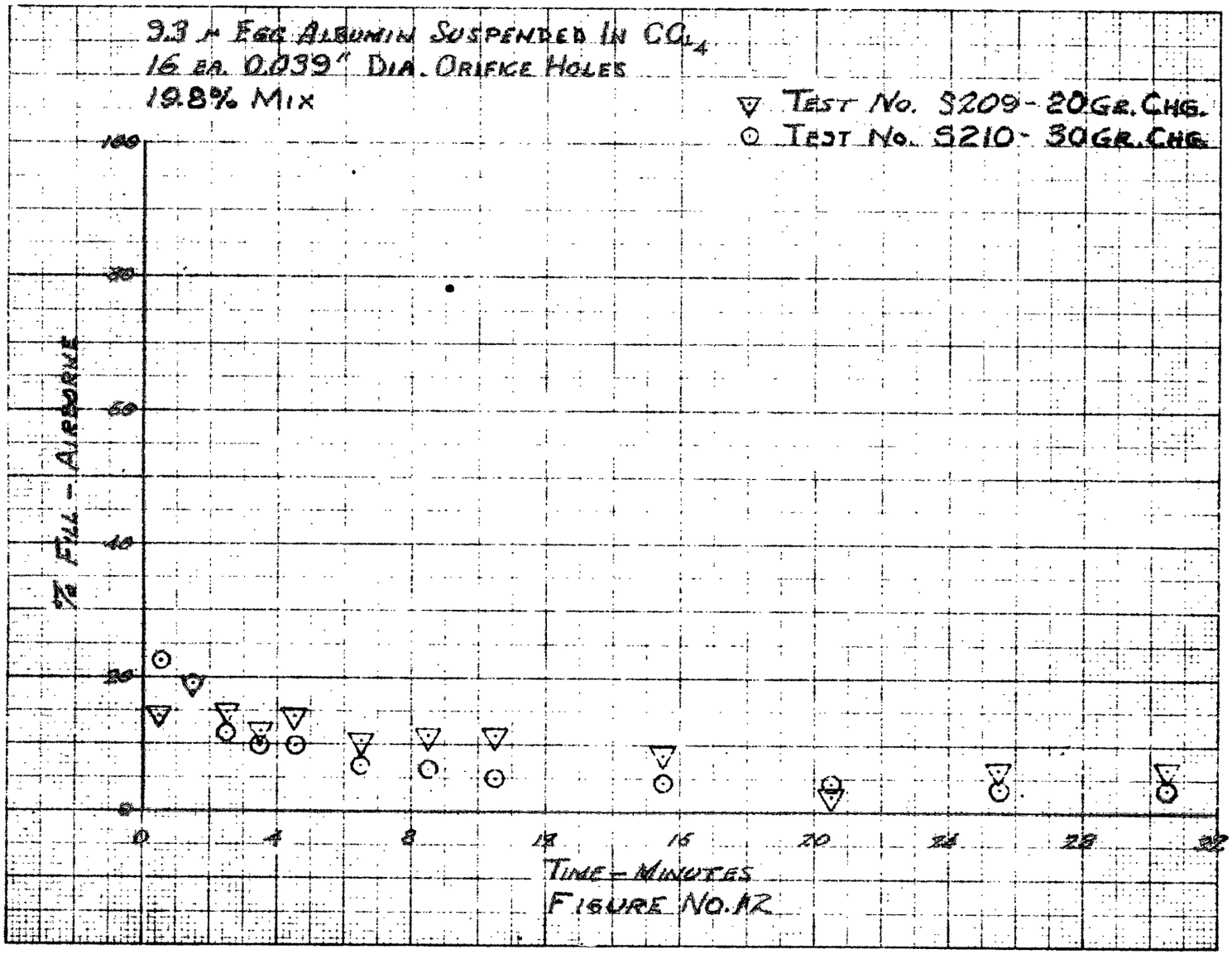


FIGURE NO. 12

AIRCRAFT ARMAMENTS, Inc.

9.3 M Egg Albumin Suspended In CCl_4
16 ea. 0.039" Dia. Orifice Holes
30 Grain Charge
Test No. S211 - 19.8 % Mix
Test No. S218 - 10.0 % Mix
Test No. S220 - 30.0 % Mix
Denotes Bubbler Sample In Chamber
% Fill - Airborne
100
80
60
40
20
0
0
4
8
12
16
20
24
28
Time - Minutes

FIGURE NO. 13

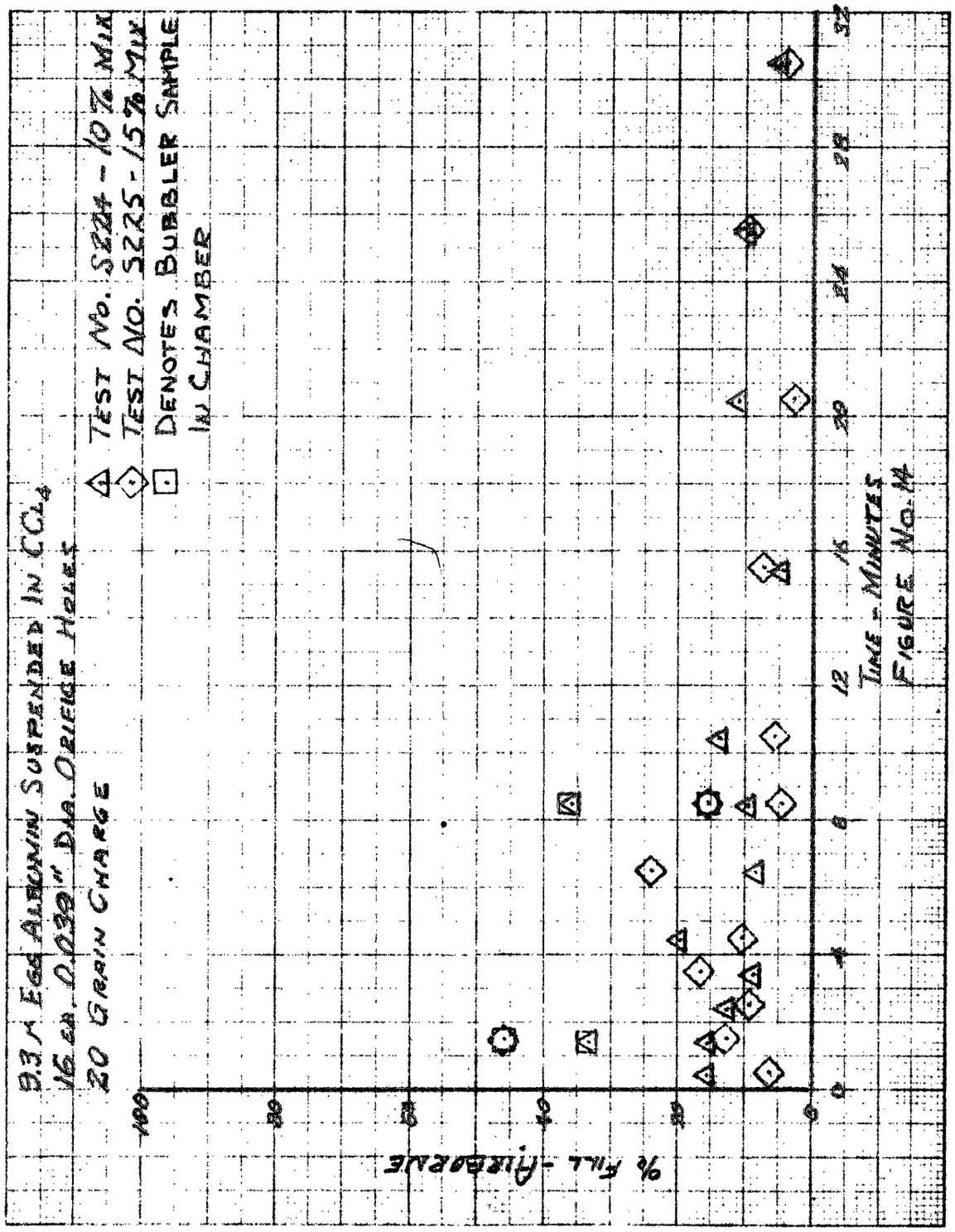
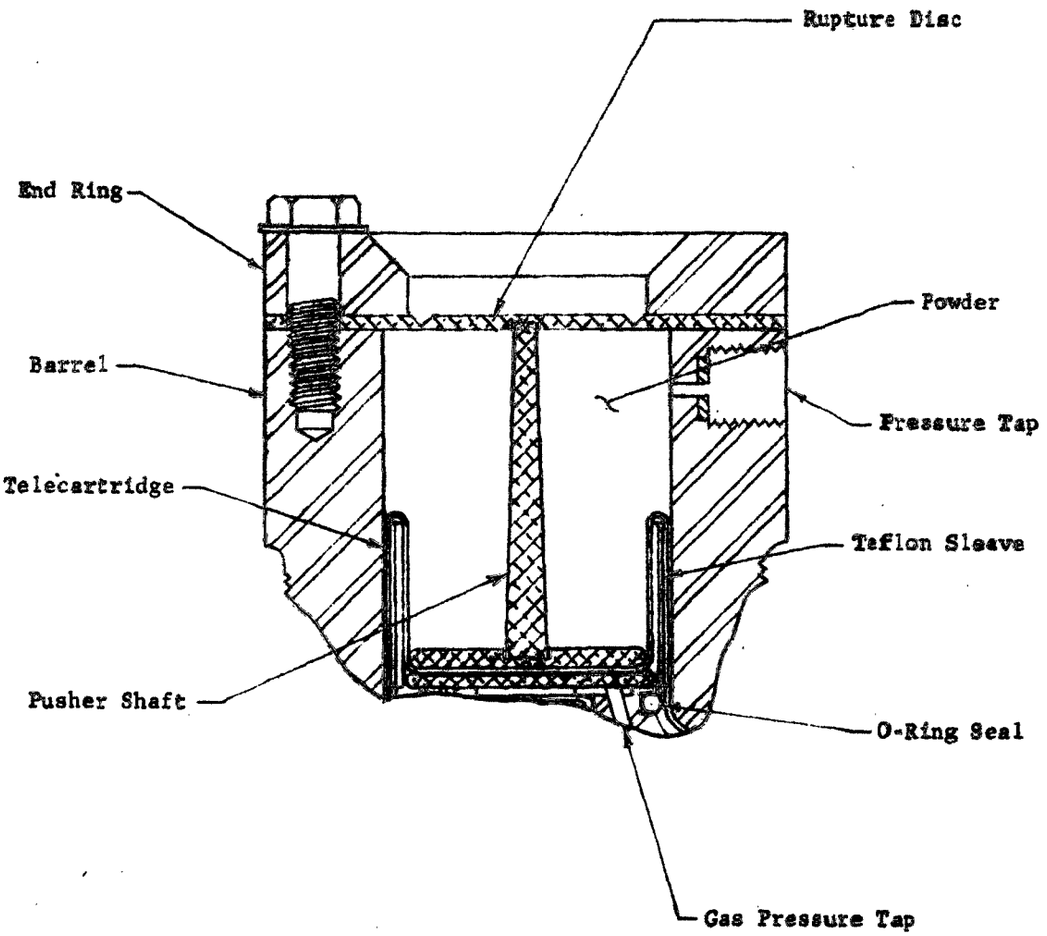
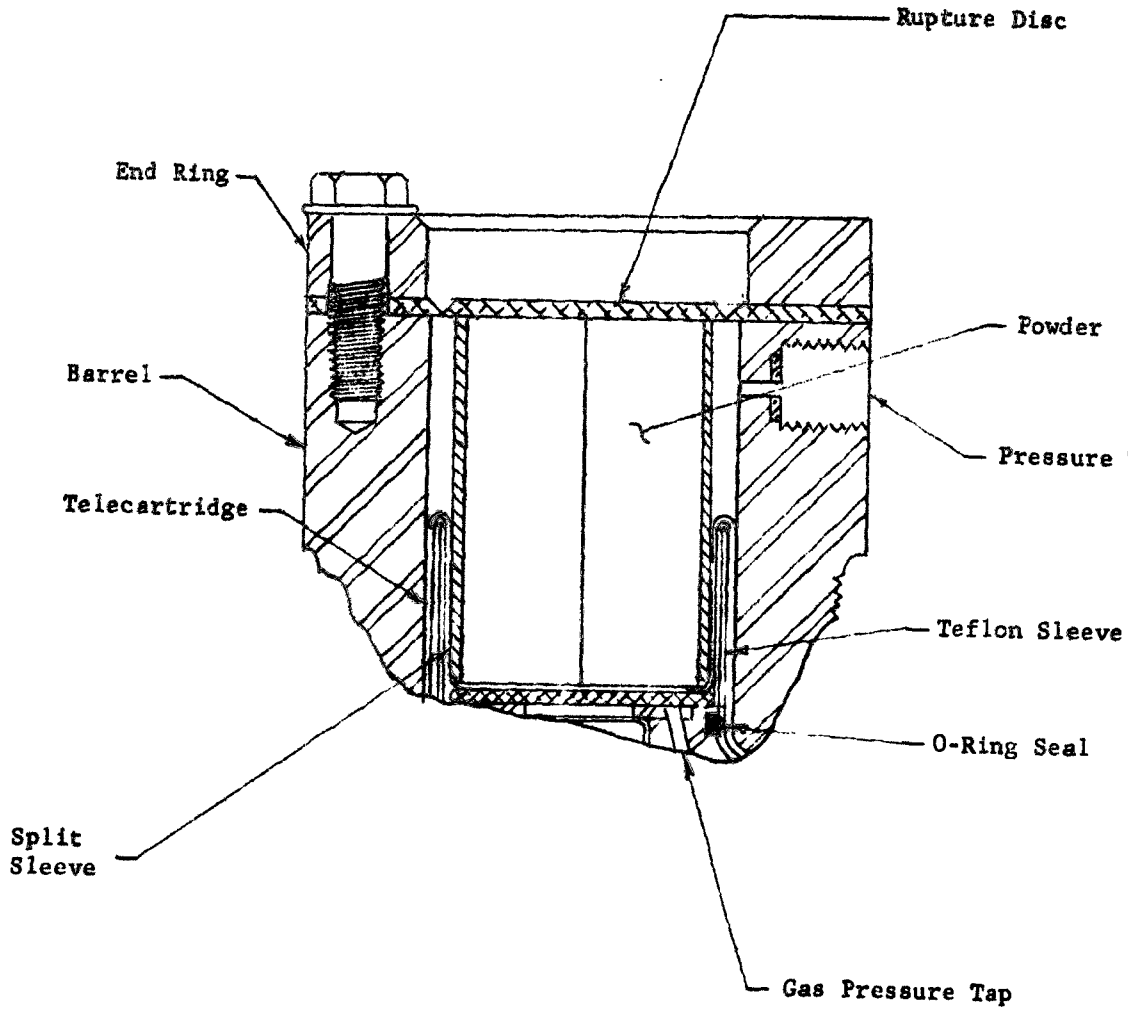

9.3% Egg Albumin Suspended In CCl_4
16 ea. 0.039" Dia. Orifice Holes
20 Grain Charge
△ Test No. 5224 - 10% Mix
◇ Test No. 5225 - 15% Mix
⊡ Denotes Bubbler Sample In Chamber
% Fill - Fireable
Time - Minutes
100
80
60
40
20
0
0
4
8
12
16
20
24
28
32

FIGURE NO. 14



Experimental Powder Dissemination Fixture
Using Pusher Shaft

FIGURE 15



Experimental Powder Dissemination Fixture
Using Split Sleeve

FIGURE 16

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Aircraft Armaments, Inc., Cockeysville, Md.
Investigation of Telecartridge Dissemination Techniques - F.C.LaTrobe, J.R.Hebert.
Report No. 2, July 1963, 18 pp - 4 illus., 6 tables, 6 curves.
Contract DA18-108-AMC-80(A) CP3-9800
Progress is reported for the following work: (1) Nozzle design for most efficient dissemination. (2) Ballistic tests.
(3) Actual test firings and instrumentation at ACC test facilities for Dimethyl Hydrogen Phosphite and Egg Albumin-Carbon Tetrachloride

1. Telecartridge Dissemination Study
2. Contract DA18-108-AMC-80(A) CP3-9800

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1. Telecartridge Dissemination Study

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